MANPOWER AND PERSONNEL LABORATORY
San Diego, California

MPL TN 84-2

SEPTEMBER 1984

VALIDATION OF ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB) SELECTION CRITERIA FOR CRYPTOLOGIC TECHNICIAN COLLECTION (CTR) "A" SCHOOL

STEPHANIE BOOTH-KEWLEY

A LABORATORY OF THE NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

MANPOWER & PERSONNEL LABORATORY
NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER
SAN DIEGO, CALIFORNIA 92152

6 September 1984

MEMORANDUM FOR DISTRIBUTION

Subj: Manpower and Personnel Laboratory Technical Note 84-2

Encl: (1) MPL TN 84-2, "Validation of Armed Services Vocational Aptitude Battery (ASVAB) Selection Criteria for Cryptologic Technician Collection (CTR) "A" School," by Stephanie Booth-Kewley

1. Enclosure (1) describes a predictive validation study conducted for CTR "A" school. The ASVAB composite currently used to select students for the school was evaluated and compared to alternate ASVAB composites. The operational ASVAB selector composite was found to be the best predictor of CTR school performance; consequently, it was recommended that this selector be retained.

2. The work reported in enclosure (1) is part of a continuing program to evaluate the effectiveness of measures used in the assignment of recruits to Navy schools and to establish standards for school entry (see also NPRDC TR 84-22, MPL TN 84-1).

3. The report is being distributed to document work of interest to Navy offices and researchers concerned with similar operational and methodological issues.

Martin F. Wiskoff

MARTIN F. WISKOFF
Director
Manpower and Personnel Laboratory

Distribution list follows.

Distribution List

Deputy Assistant Secretary of the Navy (Manpower) (OASN(M&RA))
Chief of Naval Operations (OP-11), (OP-13), (OP-987H)
Chief of Naval Education and Training (00A), (N-21)
Chief of Naval Technical Training (N-6)
Chief, Bureau of Medicine and Surgery (MED-25)
Commandant of the Marine Corps (MPI-20)
Commander Naval Military Personnel Command (NMPC-013C), (NMPC-48)
Commander Navy Recruiting Command (Code 20)
Commanding Officer, Naval Education and Training Program Development Center, Pensacola (Technical Library) (2)
Commanding Officer, Naval Technical Training Center, Corry Station (Code 101B)
Commanding Officer, Naval Training Equipment Center (Technical Library) (5), (Code 1)
Commanding Officer, Office of Naval Research Branch Office, Chicago (Coordinator for Psychological Sciences)
President, Center for Naval Analyses
Superintendent, Naval Postgraduate School
Commander, Army Research Institute for the Behavioral and Social Sciences, Alexandria (PERI-ASL), (PERI-ZT)
Commandant, U.S. Military Enlistment Processing Command, North Chicago
Commander, Air Force Human Resources Laboratory, Brooks Air Force Base (Manpower and Personnel Division)
Commander, Air Force Human Resources Laboratory, Wright-Patterson Air Force Base (AFHRL/LR)
Defense Technical Information Center (DDA) (12)

This study was conducted within work unit WRB2708 (Armed Services Vocational Aptitude Battery, document number N001184 WRB2708) and sponsored by the Chief of Naval Operations (OP-135).

MPL TN 84-2

September 1984

VALIDATION OF ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB) SELECTION CRITERIA FOR CRYPTOLOGIC TECHNICIAN COLLECTION (CTR) "A" SCHOOL

Stephanie Booth-Kewley

Reviewed by
James R. McBride
Personnel Systems Department

Released by
Martin F. Wiskoff
Manpower and Personnel Laboratory

Navy Personnel Research and Development Center
San Diego, California 92152

SUMMARY

Problem

The Armed Services Vocational Aptitude Battery (ASVAB) is used in the selection and initial assignment of recruits to Navy schools or on-the-job training. ASVAB Forms 8, 9, and 10, which became operational in October 1980, need to be validated for Cryptologic Technician Collection (CTR) Class "A" school (CDP 6301) to maintain effective standards for school selection. Furthermore, the academic attrition rate at the CTR "A" school is high, exceeding 25 percent in recent studies. The validity of the current ASVAB selection criteria for the school and the possible use of different selection criteria need to be examined in terms of school performance as well as attrition.

Objectives

The objectives of this research were to (1) examine the effectiveness of the operational CTR "A" school ASVAB selector composite (VE + AR = 97) for predicting school performance and attrition, and (2) identify alternate ASVAB composites or other measures that may be more effective than the operational composite for predicting school performance and attrition.

Method

The sample consisted of 148 students who attended the CTR "A" school at Pensacola, Florida, between July 1982 and June 1983. Due to missing data, sample sizes used for various analyses fluctuated widely.

The predictor variables were the ASVAB tests, ASVAB composites, and the Radio Code Aptitude Test (RCAT). Final school grade (FSG), days to graduate (DAYS), times seen by preventative counselor (TSBPC), times assigned remediation (TAR), and final status (FINSTAT) were used as criteria. Scores on 13 class-administered tests were supplementary criterion measures.

Pearson product-moment correlations were computed and corrected for range restriction. Multiple correlations between ASVAB tests and each of the five main criteria were calculated using a stepwise regression procedure. Expectancy tables were constructed for the operational composite, as well as for some alternate composites that appeared promising.

Results

The operational selector composite was the best overall predictor of school performance. For each of the five main criteria, as well as for the 13 unit test scores, none of the ASVAB predictors was found to be significantly more valid than the operational one. RCAT was a poor predictor of FSG, a fair predictor of DAYS, TSBPC, and TAR, and a good predictor of FINSTAT.

A comparison of expectancy analysis results for the operational composite and two experimental composites revealed that use of either of the alternate

composites would result in about the same academic drop rate (27%-29%) as now occurs.

Conclusions and Recommendations

The correlational and expectancy analysis results indicated that changing the CTR selector composite would not reduce academic attrition. Other possible explanations or remedies for the attrition may be more pertinent. Therefore, the operational CTR composite (VE + AR = 97) should be retained as the ASVAB selector composite for CTR "A" school and other possible explanations for the school's high attrition rate should be investigated.

CONTENTS

TABLES

INTRODUCTION

Problem

The Armed Services Vocational Aptitude Battery (ASVAB) is used in the selection and initial assignment of recruits to Navy schools or on-the-job training. ASVAB Forms 8, 9, and 10, which became operational in October 1980, need to be validated for Cryptologic Technician Collection (CTR) Class "A" school (CDP 6301) to maintain effective standards for school selection. Furthermore, the academic attrition rate at the CTR "A" school is high, exceeding 25 percent in recent studies (e.g., Rankin, 1983). The validity of the current ASVAB selection criteria for the school and the possible use of different selection criteria need to be examined in terms of school performance as well as attrition.

Objectives

The objectives of this research were to (1) examine the effectiveness of the operational CTR "A" school ASVAB selector composite (VE + AR = 97) for predicting school performance and attrition, and (2) identify alternate ASVAB composites or other measures that may be more effective for predicting school performance and attrition.

Background

When the ASVAB (Forms 5, 6, and 7) initially went into operation in January 1976, the selector composite used to determine eligibility for CTR "A" school consisted of the sum of two ASVAB tests, arithmetic reasoning (AR) and word knowledge (WK), with a cutting score of 100. In addition, the Radio Code Aptitude Test (RCAT), a measure of Morse code learning ability, was used in determining eligibility for the school. When ASVAB 8,9, and 10 became operational in October 1980, a selector composite consisting of the sum of AR and the verbal score (VE), which is the sum of scores on the WK and paragraph comprehension (PC) tests, replaced WK + AR, and the cutting score was lowered to 97. In April 1982, the use of RCAT was discontinued, but VE + AR = 97 continued to be used and is currently the selector composite for CTR "A" school.

METHOD

Predictors

The primary predictor variables for the present study were derived from ASVAB Forms 8, 9, and 10. They consisted of the 10 ASVAB tests comprising these forms (see Table 1), the verbal score (VE, which equals WK + PC), the Armed Forces Qualification Test (AFQT) composite score, the 12 selector composites currently in use by the Navy, and 25 experimental composites (shown in the third column of Tables 2 through 6). Also included as predictors were the RCAT and the Myers-Briggs Type Inventory (MBTI), which is a paper-and-pencil personality test. These two measures were included so that their validity for predicting school performance and attrition and their potential inclusion as school selection criteria could be evaluated.

Criteria

Because it was considered a direct and fairly complete measure of the quality of a student's performance, final school grade (FSG) served as the primary criterion of CTR "A" school performance. Also included as primary performance measures, but of lesser importance than FSG, were days to graduate (DAYS) and final status (FINSTAT), which indicated whether the student was a course graduate, an academic drop, or a nonacademic drop. Graduates were assigned a code of 1; academic drops were assigned a code of 0; nonacademic drops were excluded from the FINSTAT correlational analysis. Included as secondary performance criteria were times seen by preventative counselor (TSBPC) and times assigned remediation (TAR), which is the number of times the student was required to spend time studying outside normal classroom hours. Negative correlations were expected for the DAYS, TSBPC, and TAR criteria because a shorter time and fewer academic problems are expected for high-ability students. Scores on 13 class-administered tests covering a variety of course content areas (e.g., radio wave propagation, safety and first aid) served as supplementary criterion measures.

Sample

The sample consisted of 148 students who attended the CTR "A" school at Pensacola, Florida, between July 1982 and June 1983. Included in the sample were 92 course graduates, 39 academic drops, and 17 nonacademic drops. Due to missing data, sample sizes for the various analyses fluctuated widely, from 37 to 137, with most analyses using a sample of 92.

Table 1

Content of ASVAB Tests, Forms 8, 9, and 10

Test	Abbreviation	Description
General science	GS	A 25-item test of knowledge of the physical (13 items) and biological (12 items) sciences--11 minutes.
Arithmetic reasoning	AR	A 30-item test of ability to solve arithmetic word problems--36 minutes.
Word knowledge	WK	A 35-item test of knowledge of vocabulary, using words embedded in sentences (11 items) and synonyms (24 items)--11 minutes.
Paragraph comprehension	PC	A 15-item test of reading comprehension--13 minutes.
Numerical operations	NO	A 50-item speeded test of ability to add, subtract, multiply, and divide one-digit and two-digit numbers--3 minutes.
Coding speed	CS	An 84-item speeded test of ability to recognize numbers associated with words from a table--7 minutes.
Auto and shop information	AS	A 25-item test of knowledge of automobiles, shop practices, and use of tools--11 minutes.
Mathematics knowledge	MK	A 25-item test of knowledge of algebra, geometry, fractions, decimals, and exponents--24 minutes.
Mechanical comprehension	MC	A 25-item test of knowledge of mechanical and physical principles--19 minutes.
Electronics information	EI	A 20-item test of knowledge of electronics, radio and electrical principles and information--9 minutes.

Data Analyses

Pearson product-moment correlations among the ASVAB and RCAT predictors and the criteria were computed. The validity coefficients were corrected for either direct or indirect restriction of range, as appropriate (Thorndike, 1949, pp. 173-174), to estimate the correlations that would be obtained in a sample representing the full range of ability of Navy recruits. The population statistics used for the corrections were based on a group of 66,459 regular Navy recruits who entered the Navy from July 1981 through May 1982.

For each criterion measure, the uncorrected and corrected validity coefficients of the operational school selector composite (VE + AR) were compared with those of the other current Navy and experimental composites. Whenever any of the latter composites appeared to be more valid than the operational selector composite, the differences between the uncorrected validity coefficients were tested for significance (Johnson, 1949, p. 87).

Multiple correlations between ASVAB test scores and each criterion measure were calculated using a standard stepwise regression procedure (forward inclusion), in which the order of inclusion of predictor variables is determined by the contribution of each predictor to the variance accounted for at each step. The VE score was used instead of WK and PC scores separately in the multiple regression analyses. The multiple correlation coefficients were computed to serve as theoretical indices of the maximum predictive validity obtainable from the ASVAB tests.

The relationships between MBTI scores and the criteria were visually examined to determine whether differences existed in school performance for the various MBTI personality types.

Expectancy tables were constructed for the operational composite, as well as for some alternate composites that appeared promising on the basis of the correlational analyses. The population values used for these tables were based on the sample of 66,459 recruits that was used for correcting validity coefficients for range restriction. The purpose of conducting the expectancy analyses was to assess the practical impact of adopting either a new selector composite or a new cutting score, in terms of the numbers of students that could be expected to qualify, graduate, or drop out.

RESULTS

Correlational Analyses

Bivariate and multiple correlations of ASVAB tests and selector composites with FSG, DAYS, TSBPC, TAR, and FINSTAT are presented in Tables 2 through 6.[1] Predictors with validity coefficients that were statistically significant at

[1]All tables referred to in Results may be found at the end of the section, starting on page 8.

the .01 level were regarded as good, those with validity coefficients that were significant at the .05 but not the .01 level were regarded as fair, and those that were not significant at the .05 level were regarded as poor.

As shown in Table 2, no ASVAB composite was found to be a better predictor of FSG than VE + AR, the operational school selector composite. VE + AR, however, was only a fair predictor of FSG (ru = .21, rc = .34). Three other ASVAB composites were found to be as valid as the operational composite.

The multiple correlation of all 10 ASVAB tests with FSG was .29, only .08 correlation points higher than the uncorrected correlation of .21 obtained for the operational selector composite. Since this multiple correlation coefficient may be regarded as a measure of the maximum validity coefficient obtainable from the ASVAB, this result suggests that it would be theoretically possible to increase the validity with which FSG is predicted if a larger number of differentially weighted ASVAB tests were used in the school selection criteria. It should be noted, however, that in the operational system of Navy selector composites, the simple unweighted sums of two, three, or four ASVAB tests are used.

As shown in Table 3, none of the other current ASVAB composites was significantly more valid for predicting DAYS than was the operational composite. However, VE + AR was only a fair predictor of DAYS (ru = -.18, rc = -.29). Three of the other current Navy and experimental composites were slightly more valid for predicting DAYS than VE + AR.

The multiple correlation between the ASVAB tests and DAYS was .37 (see Table 3). This correlation was .17 correlation points higher than the uncorrected validity coefficient of the most valid composite, and it was .19 correlation points higher (in absolute magnitude) than the uncorrected validity coefficient of -.18 obtained for VE + AR. Thus, it would be theoretically possible to increase the validity for predicting DAYS if several differentially weighted ASVAB tests were used in a selector composite.

Correlations of ASVAB predictors with TSBPC are presented in Table 4. As shown, the operational composite was a poor predictor of TSBPC (ru = -.14, rc = -.24). Although many other ASVAB composites had higher correlations with TSBPC than did VE + AR, none was found to be significantly more valid than the operational composite.

The multiple correlation for predicting TSBPC was .37 (see Table 4). This correlation was .15 correlation points higher than the highest uncorrected validity coefficient, and .23 correlation points higher than the uncorrected validity coefficient of -.14 obtained for the operational composite. Again, it appears theoretically possible to increase the validity with which TSBPC is predicted by using differentially weighted ASVAB tests.

An inspection of Table 5 reveals that the operational composite was a fair predictor of TAR (ru = -.19, rc = -.31). Although many of the other current Navy and experimental composites had higher correlations with TAR than VE + AR had

(some as high as -.27 uncorrected and -.37 corrected), none was found to be significantly more valid than the operational composite.

The multiple correlation between the ASVAB tests and TAR was .43 (see Table 5). A comparison of this correlation with the validity coefficients of the selector composites revealed it to be .16 correlation points higher than the highest uncorrected correlation, and .24 correlation points higher than the uncorrected correlation of -.19 for the operational composite. Again, it appears theoretically possible to increase the validity with which TAR is predicted by using differentially weighted ASVAB tests.

Correlations of ASVAB predictors with FINSTAT are shown in Table 6. As indicated, VE + AR had essentially no validity for predicting FINSTAT (ru = -.01, rc = -.02). Although the correlations of most of the ASVAB composites were higher than that of VE + AR, none of these composites was significantly more valid than the operational composite.

The multiple correlation for predicting FINSTAT was .26 (see Table 6). This correlation was .10 correlation points higher than the highest uncorrected correlation, and it was .27 correlation points higher than the uncorrected correlation of -.01 obtained for VE + AR, suggesting that it would be theoretically possible to increase the validity with which FINSTAT is predicted using ASVAB.

Table 7 shows correlations of ASVAB subtests and current Navy composites with scores on 13 class-administered tests. As indicated, the correlations of VE + AR with the scores on these tests ranged from -.07 to .37, uncorrected, and from .19 to .42, corrected. In general, VE + AR was a fair predictor of unit test scores; the mean uncorrected and corrected correlations were .19 and .33, respectively. While a few of the other Navy composites had slightly higher mean correlations with these test scores than the operational composite, none was significantly more valid than VE + AR.

Correlations of the RCAT with the five criterion measures were computed (N = 79 for FSG, DAYS, TSBPC, and TAR; N = 112 for FINSTAT). RCAT was found to be a poor predictor of FSG (ru = .17, rc = .24), a fair predictor of DAYS (ru = -.25, rc = -.31), TSBPC (ru = -.22, rc = -.26), and TAR (ru = -.22, rc = -.28), and a good predictor of FINSTAT (ru = .26, rc = .24).

An examination of the MBTI scores and the criterion data revealed no significant relationships. Table 8 shows MBTI scale percentages for course graduates and drops (academic and nonacademic). As indicated, no substantial differences were revealed between the graduates and the drops. Similar results were obtained for the other criterion measures.

Expectancy Analyses

Table 9 presents the results of the expectancy analyses, which were conducted for VE + AR as well as for two other composites that appeared promising on the basis of the correlational analyses: AR + 2MK + GS and

VE + AR + MC. Data are presented for the current cutting score or the corresponding cutting score for an alternate composite, as well as for several cutting scores above and below the current one. The table shows the number of recruits per 1000 who would be expected to qualify for the school, as well as the number of graduates and drops who would be expected at or above the various cutting scores listed.

The expectancy analysis results displayed in Table 9 show that raising the current cutting score of 97 to 102 would result in an academic attrition rate of 27 percent, which is only one percent lower than the current academic attrition rate (28%); raising the cutting score to 105 would also result in an academic attrition rate of 27 percent.

A comparison of expectancy analysis results shown in Table 9 indicates that using the AR + 2MK + GS composite with a cutting score of 187 (which would qualify about the same number of recruits as VE + AR = 97) would result in a slightly higher academic drop rate (29%) than occurs with the operational selector (28%). Similarly, using the VE + AR + MC composite with a cutting score of 144 would result in the same academic drop rate as occurs using the operational composite.

Table 2

Correlations of ASVAB Tests and Selector Composites
With Final School Grade (FSG)

N = 92

Selector Mean: 109.21 Criterion Mean: 91.55

Selector SD: 9.50 Criterion SD: 4.92

ASVAB Tests	r_u	r_c	Operational Composites	r_u	r_c	Experimental Composites	r_u	r_c
GS	12	23	VE+AR	21*	34	MC+GS+2AS	05	15
AR	21*	34	Navy GT			CS+AR+MC+AS	12	25
WK	03	20	VE+MC+AS	06	19	CS+AR+MC+MK	19*	31
PC	09	23	Navy MECH			NO+VE+MC+AS	04	18
NO	-02	03	AR+MK+EI+GS	21*	34	NO+CS+VE+AS	05	18
CS	09	18	Navy ELEC			MK+EI+GS+AS	12	24
AS	00	07	VE+NO+CS	06	19	NO+EI+MC+AS	04	14
MK	16	28	Navy CLER			VE+MK+MC+GS	16	30
MC	08	17	VE+MC	10	24	NO+VE+AS	01	16
EI	06	13	Navy AM			AR+VE+AS	13	28
VE	07	24	AR+2MK+GS	21*	34	WK+AR	17*	32
AFQT%	13	29	Navy BE/E			WK+MC+AS	05	18
			MK+AS	09	22	WK+NO+CS	05	18
Multiple Regression			Navy BT/EN/MM			AR+MC	17*	31
R1 AR	21		VE+AR+NO+CS	13	28	CS+VE+AR	18*	32
R2+GS	23		Navy CT			MK+EI+AS	09	21
R3+NO	25		VE+MK+GS	17*	31	AR+MK+MC	19*	32
R4+CS	27		Navy HM			AR+EI+MC	16	29
R5+AS	28		AR+MC+AS	11	24	VE+MK	16	30
R9	29		Navy MR			MK+EI	15	27
			VE+AR+MC	18*	32	MK+MC+EI	14	25
			Navy SUB			AR+MK	21*	34
			MK+EI+GS	16	29	AR+EI+GS	19*	32
			Navy ELEC			AR+MK+AS	15	29
			Component			MC+MK+AS	10	22

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

*$p < .05$

Table 3

Correlations of ASVAB Tests and Selector Composites
With Days to Graduate (DAYS)

N = 92

Selector Mean: 105.61 | Criterion Mean: 99.42

Selector SD: 7.23 | Criterion SD: 99.42

ASVAB Tests	r_u	r_c	Operational Composites	r_u	r_c	Experimental Composites	r_u	r_c
GS	-06	-17	VE+AR	-18*	-29	MC+GS+2AS	03	-06
AR	-16	-28	Navy GT			CS+AR+MC+AS	-08	-19
WK	-10	-22	VE+MC+AS	-02	-14	CS+AR+MC+MK	-19*	-30
PC	-01	-15	Navy MECH			NO+VE+MC+AS	02	-11
NO	10	05	AR+MK+EI+GS	-12	-25	NO+CS+VE+AS	03	-09
CS	-12	-19	Navy ELEC			MK+EI+GS+AS	-01	-13
AS	12	06	VE+NO+CS	-05	-16	NO+EI+MC+AS	01	-04
MK	-15	-25	Navy CLER			VE+MK+MC+GS	-16	-27
MC	-13	-20	VE+MC	-14	-24	NO+VE+AS	10	-04
EI	06	-02	Navy AM			AR+VE+AS	-02	-18
VE	-08	-22	AR+2MK+GS	-18*	-29	WK+AR	-18*	-30
AFQT%	-09	-24	Navy BE/E			WK+MC+AS	-03	-15
			MK+AS	-01	-12	WK+NO+CS	-05	-17
Multiple			Navy BT/EN/MM			AR+MC	-18*	-29
Regression			VE+AR+NO+CS	-09	-22	CS+VE+AR	-17*	-29
R1 AR	16		Navy CT			MK+EI+AS	02	-10
R2+AS	22		VE+MK+GS	-15	-27	AR+MK+MC	-20*	-30
R3+MC	30		Navy HM			AR+EI+MC	-11	-23
R4+NO	33		AR+MC+AS	-05	-17	VE+MK	-16	-28
R5+CS	35		Navy MR			MK+EI	-07	-19
R9	37		VE+AR+MC	-19*	-30	MK+MC+EI	-11	-22
			Navy SUB			AR+MK	-18*	-29
			MK+EI+GS	-08	-20	AR+EI+GS	-08	-22
			Navy ELEC			AR+MK+AS	-06	-20
			Component			MC+MK+AS	-06	-17

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

*p < .05

Table 4

Correlations of ASVAB Tests and Selector Composites
With Times Seen By Preventative Counselor (TSBPC)

N = 92

Selector Mean: 105.61

Selector SD: 7.23

Criterion Mean: 1.01

Criterion SD: 1.71

ASVAB Tests	r_u	r_c	Operational Composites	r_u	r_c	Experimental Composites	r_u	r_c
GS	-05	-14	VE+AR	-14	-24	MC+GS+2AS	02	-06
AR	-16	-25	Navy GT			CS+AR+MC+AS	-09	-18
WK	-03	-14	VE+MC+AS	-03	-12	CS+AR+MC+MK	-19*	-27
PC	-02	-13	Navy MECH			NO+VE+MC+AS	-01	-11
NO	05	01	AR+MK+EI+GS	-11	21	NO+CS+VE+AS	04	-06
CS	-08	-14	Navy ELEC			MK+EI+GS+AS	01	-10
AS	12	07	VE+NO+CS	-03	-12	NO+EI+MC+AS	-02	-06
MK	-12	-20	Navy CLER			VE+MK+MC+GS	-15	-24
MC	-18*	-24	VE+MC	-16	-24	NO+VE+AS	10	-02
EI	05	-01	Navy AM			AR+VE+AS	00	-14
VE	-03	-15	AR+2MK+GS	-15	-24	WK+AR	-14	-23
AFQT%	-09	-21	Navy BE/E			WK+MC+AS	-03	-13
			MK+AS	01	-09	WK+NO+CS	-03	-12
Multiple			Navy BT/EN/MM			AR+MC	-22*	-29
Regression			VE+AR+NO+CS	-08	-19	CS+VE+AR	-13	-23
R1 MC	18		Navy CT			MK+EI+AS	03	-07
R2+AS	33		VE+MK+GS	-10	-20	AR+MK+MC	-21*	-28
R3+AR	36		Navy HM			AR+EI+MC	-15	-23
R4+NO	36		AR+MC+AS	-08	-17	VE+MK	-11	-21
R5+CS	37		Navy MR			MK+EI	-05	-15
R9	37		VE+AR+MC	-20*	-28	MK+MC+EI	-16	-21
			Navy SUB			AR+MK	-16	-25
			MK+EI+GS	-06	-16	AR+EI+GS	-08	-19
			Navy ELEC			AR+MK+AS	-05	-16
			Component			MC+MK+AS	-07	-15

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

*$p < .05$

Table 5

Correlations of ASVAB Tests and Selector Composites
With Times Assigned Remediation (TAR)

N = 92

Selector Mean: 105.61 Criterion Mean: 2.51

Selector SD: 7.23 Criterion SD: 4.21

ASVAB Tests	r_u	r_c	Operational Composites	r_u	r_c	Experimental Composites	r_u	r_c
GS	-09	-20	VE+AR	-19*	-31	MC+GS+2AS	-02	-12
AR	-19*	-31	Navy GT			CS+AR+MC+AS	-13	-24
WK	-06	-21	VE+MC+AS	-07	-19	CS+AR+MC+MK	-25**	-34
PC	-08	-21	Navy MECH			NO+VE+MC+AS	-07	-19
NO	-02	-07	AR+MK+EI+GS	-14	-27	NO+CS+VE+AS	04	-13
CS	-09	-16	Navy ELEC			MK+EI+GS+AS	01	-15
AS	11	04	VE+NO+CS	-08	-20	NO+EI+MC+AS	-02	-11
MK	-17*	-28	Navy CLER			VE+MK+MC+GS	-22*	-33
MC	-23*	-30	VE+MC	-21*	-32	NO+VE+AS	04	-10
EI	10	02	Navy AM			AR+VE+AS	-04	-21
VE	-06	-21	AR+2MK+GS	-21*	-32	WK+AR	-18*	-31
AFQT%	-19*	-31	Navy BE/E			WK+MC+AS	-07	-19
			MK+AS	-03	-15	WK+NO+CS	-08	-20
Multiple			Navy BT/EN/MM			AR+MC	-27**	-37
Regression			VE+AR+NO+CS	-08	-27	CS+VE+AR	-16	-29
R1 MC	23		Navy CT			MK+EI+AS	02	-11
R2+AS	37		VE+MK+GS	-17*	-29	AR+MK+MC	-27**	-36
R3+AR	40		Navy HM			AR+EI+MC	-17*	-28
R4+EI	42		AR+MC+AS	-12	-24	VE+MK	-17*	-29
R5+GS	42		Navy MR			MK+EI	-06	-19
R9	43		VE+AR+MC	-26**	-36	MK+MC+EI	-16	-26
			Navy SUB			AR+MK	-21*	-32
			MK+EI+GS	-09	-22	AR+EI+GS	-09	-23
			Navy ELEC			AR+MK+AS	-10	-23
			Component			MC+MK+AS	-12	-17

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

*p < .05.
**p < .01.

Table 6

Correlations of ASVAB Tests and Selector Composites
With Final Status (FINSTAT)

N = 130

Selector Mean: 105.66 Criterion Mean: .70

Selector SD: 7.63 Criterion SD: .46

ASVAB Tests	r_u	r_c	Operational Composites	r_u	r_c	Experimental Composites	r_u	r_c
GS	-03	-03	VE+AR	-01	-02	MC+GS+2AS	-02	-02
AR	-02	-03	Navy GT			CS+AR+MC+AS	04	03
WK	-06	-06	VE+MC+AS	01	00	CS+AR+MC+MK	10	07
PC	10	07	Navy MECH			NO+VE+MC+AS	06	04
NO	18*	17	AR+MK+EI+GS	-02	-02	NO+CS+VE+AS	09	07
CS	15*	14	Navy ELEC			MK+EI+GS+AS	-04	-04
AS	-06	-07	VE+NO+CS	16*	13	NO+EI+MC+AS	02	01
MK	07	05	Navy CLER			VE+MK+MC+GS	05	03
MC	07	06	VE+MC	06	04	NO+VE+AS	03	02
EI	-08	-08	Navy AM			AR+VE+AS	-06	-05
VE	00	-01	AR+2MK+GS	04	02	WK+AR	-06	-05
AFQT%	06	03	Navy BE/E			WK+MC+AS	-02	-02
			MK+AS	-01	-02	WK+NO+CS	13	11
Multiple			Navy BT/EN/MM			AR+MC	04	02
Regression			VE+AR+NO+CS	13	09	CS+VE+AR	08	05
R1 CS	15		Navy CT			MK+EI+AS	-04	-04
R2+AS	17		VE+MK+GS	03	01	AR+MK+MC	06	03
R3+MC	21		Navy HM			AR+EI+MC	-01	-01
R4+NO	22		AR+MC+AS	-01	-02	VE+MK	05	03
R5+AR	24		Navy MR			MK+EI	-01	-01
R9	26		VE+AR+MC	04	02	MK+MC+EI	03	02
			Navy SUB			AR+MK	03	02
			MK+EI+GS	-02	-02	AR+EI+GS	-06	-06
			Navy ELEC			AR+MK+AS	-03	-03
			Component			MC+MK+AS	02	01

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

*$p < .05$.

Table 7

Correlations of ASVAB Tests and Selector Composites
With Scores on 13 Class-administered Tests

ASVAB Predictor	Unit 2 Test N = 116		Unit 3 Test N = 137		Unit 4 Test N = 37		Unit 6 Test N = 130		Unit 7 Test N = 122		Unit 8 Test N = 93	
	r_u	r_c	r_u	r_c	r_u	r_c	r_u	r_c	r_u	r_c	r_u	r_c
GS	01	13	05	17	47	52	10	21	12	24	23	32
AR	12	25	13	27	29	38	19	32	21	33	24	36
WK	-06	11	19	30	25	35	08	23	11	25	06	22
PC	14	25	20	30	08	21	11	24	24	34	25	35
NO	-09	-04	-09	-05	-20	-18	02	05	02	04	10	14
CS	-12	-05	-05	03	12	20	06	14	08	16	14	21
AS	-02	05	-14	-04	34	41	17	23	03	10	24	29
MK	10	21	09	21	25	33	30	39	26	36	27	37
MC	11	19	-09	03	51	56	16	25	09	19	26	33
EI	08	16	06	15	23	33	08	16	03	11	20	26
VE	02	17	22	33	20	31	11	25	16	29	14	28
AFQT	04	20	17	30	23	34	20	33	23	35	24	36
VE+AR	10	25	24	34	37	42	21	34	26	36	28	38
VE+MC+AS	05	17	-04	11	49	52	20	31	11	24	30	39
AR+MK+EI+GS	11	25	12	26	47	51	26	37	25	35	36	44
VE+NO+CS	-11	03	01	13	07	20	08	20	13	24	16	28
VE+MC	10	22	05	19	48	52	18	30	15	28	27	37
AR+2MK+GS	11	24	11	25	44	49	30	40	29	39	33	42
MK+AS	05	17	-02	12	42	49	30	38	19	29	34	42
VE+AR+NO+CS	-05	11	05	20	17	30	14	27	18	30	23	35
VE+MK+GS	06	21	15	28	47	51	25	35	26	36	30	40
AR+MC+AS	09	21	-05	11	50	54	22	33	13	25	34	43
VE+AR+MC	13	26	10	25	49	51	23	35	22	34	33	42
MK+EI+GS	09	22	10	23	44	50	24	34	21	32	34	43

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

Table 7 (Continued)

ASVAB Predictor	Unit 9 Test N = 92		Unit 11 Test N = 93		Unit 2 Test N = 93		Unit 13 Test N = 93		Unit 14 Test N = 93		Unit 15A Test N = 93	
	r_u	r_c	r_u	r_c	r_u	r_c	r_u	r_c	r_u	r_c	r_u	r_c
GS	15	26	18	28	05	18	24	34	16	27	19	29
AR	18	32	23	36	-02	19	11	27	09	26	13	29
WK	13	28	07	23	-12	09	06	22	-02	16	10	25
PC	20	32	15	28	-03	13	27	37	12	25	11	25
NO	04	08	10	14	04	09	-06	00	-02	03	04	08
CS	05	14	09	17	-04	06	12	20	-02	08	05	14
AS	14	19	12	18	-07	00	-07	00	03	10	01	08
MK	19	31	33	42	07	21	13	26	00	15	15	27
MC	-03	07	19	27	08	18	10	19	05	15	05	14
EI	-01	07	16	23	-05	03	-01	07	06	14	20	26
VE	18	32	11	26	-08	13	15	29	04	21	13	28
AFQT	24	36	21	35	-05	19	13	29	02	23	13	30
VE+AR	25	37	25	36	-07	19	18	33	09	28	18	33
VE+MC+AS	11	24	19	30	-03	12	06	19	06	19	07	20
AR+MK+EI+GS	20	33	35	44	03	21	18	32	11	27	25	37
VE+NO+CS	11	24	13	25	-03	12	09	22	-01	14	10	22
VE+MC	07	22	20	32	02	19	15	29	06	21	10	25
AR+2MK+GS	24	36	37	45	07	24	20	33	07	24	20	33
MK+AS	21	31	28	37	-01	13	03	16	02	15	09	21
VE+AR+NO+CS	16	30	20	33	-03	17	12	27	02	20	14	28
VE+MK+GS	24	36	31	41	04	21	24	36	09	25	22	34
AR+MC+AS	11	25	23	33	-01	15	05	19	07	21	07	21
VE+AR+MC	14	29	27	38	01	21	18	32	09	26	14	30
MK+EI+GS	17	29	33	42	04	19	17	30	10	24	25	36

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

Table 7 (Continued)

ASVAB Predictor	Unit 15B Test N = 92		Unit 2-15B Tests Mean	
Predictor	ru r_u	rc r_c	ru r_u	rc r_c
GS	09	21	16	26
AR	16	30	16	30
WK	-03	16	06	22
PC	-01	15	14	26
NO	-23	-16	-03	02
CS	-05	05	03	12
AS	-05	02	06	12
MK	02	17	17	28
MC	03	13	12	21
EI	04	12	08	16
VE	-01	18	11	25
AFQT	-10	16	13	29
VE+AR	12	29	19	33
VE+MC+AS	-02	13	12	24
AR+MK+EI+GS	11	27	22	34
VE+NO+CS	-15	02	04	18
VE+MC	02	18	14	27
AR+2MK+GS	09	25	22	34
MK+AS	-02	12	14	26
VE+AR+NO+CS	-07	13	10	25
VE+MK+GS	05	23	21	33
AR+MC+AS	04	19	14	26
VE+AR+MC	09	26	19	32
MK+EI+GS	07	22	20	31

Note. Decimals have been omitted. r_u = uncorrected correlation; r_c = corrected correlation.

Table 8

Percentages of CTR "A" School Graduates and Drops
by Myers-Briggs Type Indicator Scale (MBTI) Personality Type

MBTI Personality Type	Graduates (N = 54) %	Drops (N = 27) %
Introvert	56	67
Extrovert	44	33
Sensing	72	81
Intuition	28	19
Thinking	63	59
Feeling	37	41
Judging	54	48
Perceptive	46	52

Table 9

Expectancy Analysis of VE + AR
and Two Experimental Composites
(N = 92 graduates, 38 academic drops, 130 total)

Selector Cutting Score	Acad Grad N	Drop N	Total N	Grad %	Acad Drop %	At or Above Cut Score in Recruit Population N	Expectancies per 1000 in Population		
							Total N	Grad N	Acad Drop N
Operational Selector: VE + AR = 97									
≥ 91	92	38	130	71	29	89	890	632	258
≥ 92	92	38	130	71	29	87	870	618	252
≥ 97	92	36	128	72	28	78	780	562	218
≥ 98	87	31	118	74	26	75	750	555	195
≥ 102	60	22	82	73	27	65	650	475	175
≥ 104	49	19	68	72	28	59	590	425	165
≥ 105	46	17	63	73	27	59	560	409	151
Experimental Selector: AR + 2MK + GS									
≥ 177	89	38	127	70	30	88	880	616	264
≥ 179	84	35	119	71	29	87	870	618	252
≥ 187	75	30	105	71	29	78	780	554	226
≥ 190	70	29	99	71	29	74	740	525	215
≥ 196	60	26	86	70	30	66	660	462	198
≥ 201	52	24	76	68	32	59	590	401	189
≥ 202	51	22	73	70	30	59	590	413	177
Experimental Selector: VE + AR + MC									
≥ 135	91	37	128	71	29	89	890	632	258
≥ 137	90	37	127	71	29	87	870	618	252
≥ 144	76	29	105	72	28	78	780	562	218
≥ 146	73	28	101	72	28	75	750	540	210
≥ 151	56	20	76	74	26	65	650	481	169
≥ 154	46	18	64	72	28	60	600	432	168
≥ 155	43	16	59	73	27	58	580	423	157

DISCUSSION

Based on the results of the expectancy and correlational analyses, it appears that VE + AR, the operational composite, is the best overall predictor of school performance. For final school grade, which was considered to be the most important criterion measure, no ASVAB composite was found to be a better predictor, a finding that has been supported by results of past ASVAB (Forms 6 and 7) validation studies (e. g., Swanson, 1979), as well as by results of a recent ASVAB 8, 9, and 10 validation study, of which CTR "A" school is a part (Booth-Kewley, manuscript submitted for publication). Based on a sample size of 140 used in the latter investigation, the operational composite was found to be a good predictor of FSG (ru = .50, rc = .59); it was more valid than any other current Navy ASVAB composite. These results indicate that changing to one of the other Navy or experimental ASVAB composites would not increase the effectiveness with which final school grade is predicted.

Similarly, results for the other school performance measures, days to graduate (DAYS), times seen by preventative counselor (TSBPC), times assigned remediation (TAR), and final status (FINSTAT), indicated that changing to one of the other Navy or experimental ASVAB composites would not improve prediction of school performance. Furthermore, prediction of scores on the 13 class-administered tests would not be improved by adopting one of the alternate ASVAB selector composites.

The multiple regression analyses showed that for the FSG, DAYS, TSBPC, TAR, and FINSTAT criteria, it would be theoretically possible to increase the predictive validity of the school selector composite if a number of differentially weighted ASVAB tests were used. However, using weighted composites of several tests would necessitate changing the present system of Navy selector composites that uses the simple unweighted sums of two, three, or four ASVAB tests. A more significant problem with changing selector composites is that the ASVAB tests and the weights revealed by the multiple regression to be best for predicting performance differed for the various criterion measures.

The RCAT was found to be a poor predictor of FSG, a fair predictor of DAYS, TSBPC, and TAR, and a good predictor of FINSTAT. The MBTI was not found to be a useful predictor of school performance.

Expectancy analyses of the operational composite and two other composites, which appeared promising on the basis of the correlational analyses, revealed that neither raising the cutting score of the operational composite nor changing selector composites would appreciably reduce academic attrition.

CONCLUSIONS AND RECOMMENDATIONS

The correlational and expectancy analysis results indicated that changing the CTR selector composite would not reduce academic attrition. Other possible explanations or remedies for the attrition may be more pertinent. Therefore, the operational CTR composite (VE + AR = 97) should be retained as the ASVAB selector composite for CTR "A" school and other possible explanations for the school's high attrition rate should be investigated.

REFERENCES

Booth-Kewley, S. (1984). Validation of the Armed Services Vocational Aptitude Battery (ASVAB): Selection criteria for the Strategic Weapons Systems Electronics "A" school (NPRDC TR 84-22). San Diego: Navy Personnel Research and Development Center.

Booth-Kewley, S. (1984). Validation of the Armed Services Vocational Aptitude Battery (ASVAB) in Cryptologic Technician Technical (CTT) "A" school (MPL TN 84-1). San Diego: Manpower and Personnel Laboratory, Navy Personnel Research and Development Center.

Booth-Kewley, S. Predictive validation of the Armed Services Vocational Aptitude Battery Forms 8, 9, and 10 against performance in 100 Navy schools. Manuscript submitted for publication, Navy Personnel Research and Development Center, San Diego.

Johnson, P. O. (1949). Statistical methods in research. New York: Prentice-Hall.

Rankin, W. C. (1983, July). Predicting academic attrition from Cryptologic Technician (CT) "A" schools using ASVAB and Morse code performance (TAEG Tech. Memo. 83-6). Orlando, FL: Training Analysis and Evaluation Group.

Swanson, L. (1979). Armed Services Vocational Aptitude Battery, Forms 6 & 7 validation against school performance in Navy enlisted schools (July 1976-February 1978) (NPRDC Tech. Rep. 80-1). San Diego: Navy Personnel Research and Development Center. (AD-A077 158)

Thorndike, R. L. (1949). Personnel selection. New York: Wiley.

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Navy Personnel Research and Development Center--Manpower and Personnel Laboratory 6b. OFFICE SYMBOL (if applicable) 06	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State and ZIP Code) San Diego, CA 92152	7b. ADDRESS (City, State and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Chief of Naval Operations Enlisted Programs Implementation Branch 8b. OFFICE SYMBOL (if applicable) OP-135L	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State and ZIP Code) Washington, D.C. 20350	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT NO. WRB2708

11. TITLE (include Security Classification)
Validation of Armed Services Vocational Aptitude Battery (ASVAB) Selection Criteria for Cryptologic Technician Collection "A" School

12. PERSONAL AUTHOR(S)
Booth-Kewley, Stephanie

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM 7/82 TO 6/83		

16. SUPPLEMENTARY NOTATION
RR62-84-01

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	
05	09		Armed Services Vocational Aptitude Battery (ASVAB); test validation; predictive validation; Cryptologic Technician Collection "A" school

19. ABSTRACT (Continue on reverse if necessary and identify by block number)
This predictive validation study was conducted to evaluate the effectiveness of the operational Armed Services Vocational Aptitude Battery (ASVAB) selector composite for predicting preformance in Cryptologic Technician Collection (CTR) "A" school and to investigate the possible use of alternative ASVAB selector composites. Correlational and expectancy analysis results indicated that the current ASVAB composite was the best predictor of performance.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Stephanie Booth-Kewley	22b. TELEPHONE (include Area Code) (619) 225-2181 / 22c. OFFICE SYMBOL 62

DD FORM 1473, 84 JAN

83 APR EDITION MAY BE USED UNTIL EXHAUSTED
ALL OTHER EDITIONS ARE OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE